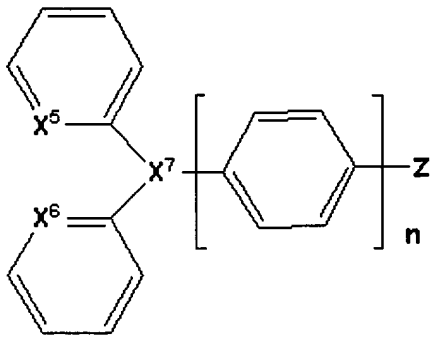
WE CLAIM:

1. A compound having a general formula (1A):



(1A)

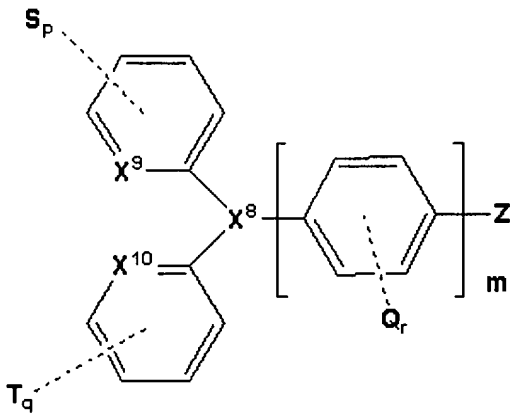
where X^5, X^6 and X^7 are each independently selected from the group consisting of carbon and nitrogen;

n is a number from 0-2;

Z is a substituted or unsubstituted aryl moiety selected from the group consisting of phenyl, biphenyl, naphthyl, anthryl, phenanthryl, pyrenyl, pyridyl, bipyridyl, indyl, and quinolinyl; and

wherein a said substituent is selected from the group consisting of an aryl group, an alkoxy group, a hydroxy group, a halo group, an amino group, a nitro group, a nitrile group, $-CF_3$ and an aliphatic group having 1-24 carbon atoms which may be straight, branched or cyclic.

2. A compound having a general formula (1B):



(1B)

where X^8, X^9 and X^{10} are each independently selected from the group consisting of a substituted or unsubstituted carbon, an unsubstituted nitrogen and a substituted or unsubstituted silicon;

m is a number from 0-10;

Q, S and T are the same or different and are selected from the group consisting of an aryl group, an alkoxy group, a hydroxy group, a halo group, an amino group, a nitro group, a nitrile group, $-CF_3$ and an aliphatic group having 1-24 carbon atoms which may be straight, branched or cyclic;

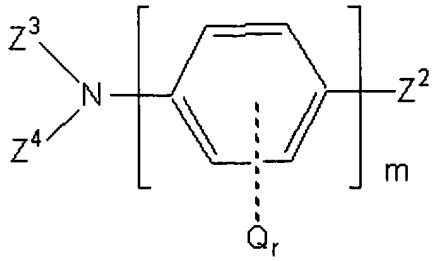
p and q are the same or different and are a number between 0-5;

r is a number between 0-4;

Z is a substituted or unsubstituted aryl moiety selected from the group consisting of phenyl, biphenyl, naphthyl, anthryl, phenanthryl, pyrenyl, pyridyl, bipyridyl, indyl, and quinolinyl;

wherein a said substituent is selected from the group consisting of an aryl group, an alkoxy group, a hydroxy group, a halo group, an amino group, a nitro group, a nitrile group, $-CF_3$ and an aliphatic group having 1-24 carbon atoms which may be straight, branched or cyclic.

3. A compound having a general formula (1C):



(1C)

where

Z^2, Z^3 and Z^4 are each independently a substituted or unsubstituted aryl moiety selected from the group consisting of phenyl, biphenyl, naphthyl, anthryl, phenanthryl, pyrenyl, pyridyl, bipyridyl, indyl, and quinolinyl;

m is a number from 0-10;

Q is selected from the group consisting of an aryl group, an alkoxy group, a hydroxy group, a halo group, an amino group, a nitro group, a nitrile group, $-CF_3$ and an aliphatic group having 1-24 carbon atoms which may be straight, branched or cyclic;

r is a number between 0 and 4;

wherein a said substituent is selected from the group consisting of an aryl group, an alkoxy group, a hydroxy group, a halo group, an amino group, a nitro group, a nitrile group, $-CF_3$ and an aliphatic group having 1-24 carbon atoms which may be straight, branched or cyclic.

4. A compound as claimed in claim 1, wherein said compound is photoluminescent or electroluminescent.

5. A compound as claimed in claim 2, wherein said compound is photoluminescent or electroluminescent.

6. A compound as claimed in claim 3, wherein said compound is photoluminescent or electroluminescent.

7. A compound as claimed in claim 1, 2 or 3 wherein said compound is a hole transporter.

8. A compound as claimed in claim 1, wherein X^5, X^6 and X^7 are each independently selected from the group consisting of a substituted carbon, an unsubstituted carbon and an unsubstituted nitrogen.

9. A compound as claimed in claim 1, wherein at least one of X^5, X^6 and X^7 is nitrogen.

10. A compound as claimed in claim 1, wherein X^5, X^6 and X^7 are nitrogen.

11. A method of synthesizing a compound as claimed in claim 1, comprising a step selected from the group consisting of:

1-bromopyrenyl + 2,2'-dipyridylamine + CuI + K_3PO_4 + 1,2-transdiaminocyclohexane + 1,4-dioxane
→ 1-pyrenyl-2,2'-dipyridylamine (2);

$Pd(PPh_3)_4$ + 1-bromopyrene + *p*-(2,2'-dipyridylamino)phenyl boronic acid
→ 4-(1-pyrenyl)phenyl-2,2'-dipyridylamine(3);

$Pd(PPh_3)_4$ + 1-bromopyrene + *p*-(2,2'-dipyridylamino)biphenylboronic acid
→ 4-[4'-(1-pyrenyl)biphenyl]-2,2'-dipyridylamine(4);

4-iodo-4'-diphenylaminobiphenyl + $B(OCH_3)_3$ + N-BuLi
→ 4-(1-pyrenyl)biphenyl-2,2'-diphenylamine (5); and

p-N-(1-naphthyl)-N-phenylamino-biphenyl-iodide + B(*i*-OPr)$_3$ + N-BuLi
→ *p*-N-(1-naphthyl)-N-phenylamino-biphenyl-$B(OH)_2$ + 5-bromo-8-methoxyquinoline + $Pd(OAc)_2$ + PPh_3 + Na_2CO_3 → QNPB (6).

12. A compound as claimed in claim 2,
wherein

X^8 is selected from the group consisting of a substituted or unsubstituted carbon, an unsubstituted nitrogen and a substituted or unsubstituted silicon;

X^9 and X^{10} are each independently selected from the group consisting of a substituted or unsubstituted carbon and an unsubstituted nitrogen; and

m is a number from 0 to 4.

13. A compound as claimed in claim 2,
wherein

X^8 is nitrogen;

X^9 and X^{10} are each independently selected from the group consisting of a substituted or unsubstituted carbon and an unsubstituted nitrogen; and

m is a number from 1 to 4.

14. A method of synthesizing a compound as claimed in claim 2, comprising a step selected from the group consisting of:

1-bromopyrenyl + 2,2'-dipyridylamine + CuI + K_3PO_4 + 1,2-transdiaminocyclohexane + 1,4-dioxane
➔ 1-pyrenyl-2,2'-dipyridylamine (2);

$Pd(PPh_3)_4$ + 1-bromopyrene + *p*-(2,2'-dipyridylamino)phenyl boronic acid
➔ 4-(1-pyrenyl)phenyl-2,2'-dipyridylamine(3);

$Pd(PPh_3)_4$ + 1-bromopyrene + *p*-(2,2'-dipyridylamino)biphenylboronic acid
➔ 4-[4'-(1-pyrenyl)biphenyl]-2,2'-dipyridylamine(4); and

4-iodo-4'-diphenylaminobiphenyl + $B(OCH_3)_3$ + N-BuLi
➔ 4-(1-pyrenyl)biphenyl-2,2'-diphenylamine (5).

15. A method of synthesizing a compound as claimed in claim 3, comprising a step selected from the group consisting of:

p-N-(1-naphthyl)-N-phenylamino-biphenyl-iodide + $B(i\text{-}OPr)_3$ + N-BuLi → *p*-N-(1-naphthyl)-N-phenylamino-biphenyl-$B(OH)_2$ + 5-bromo-8-methoxyquinoline + $Pd(OAc)_2$ + PPh_3 + Na_2CO_3 → QNPB (6).

16. A photoluminescent or electroluminescent compound having a formula selected from the group consisting of 1-pyrenyl-2,2'-dipyridylamine (2), 4-(1-pyrenyl)phenyl-2,2'-dipyridylamine (3), 4-[4'-(1-pyrenyl)biphenyl]-2,2'-dipyridylamine (4), 4-(1-pyrenyl)biphenyl-2,2'-diphenylamine (5) and QNPB (6).

17. A composition comprising a compound as claimed in claim 1, an organic polymer and a solvent.

18. A composition comprising a compound as claimed in claim 2, an organic polymer and a solvent.

19. A composition comprising a compound as claimed in claim 3, an organic polymer and a solvent.

20. A photoluminescent product or an electroluminescent product comprising a compound as claimed in claim 1, 2, 3 or 16.

21. The product of claim 20 which is a flat panel display device.

22. The product of claim 20 which is a luminescent probe.

23. A method of producing electroluminescence, comprising the steps of: providing an electroluminescent compound as claimed in claim 4, 5, or 6 and applying a voltage across said compound so that said compound electroluminesces.

24. An electroluminescent device for use with an applied voltage, comprising:
a first electrode,

an emitter which is an electroluminescent compound as claimed in claim 4, 5, or 6, and

a second, transparent electrode,

wherein voltage is applied to the two electrodes to produce an electric field across the emitter so that the emitter electroluminesces.

25. An electroluminescent device for use with an applied voltage, comprising:

a first electrode,

a second, transparent electrode,

an electron transport layer adjacent the first electrode,

a hole transport layer adjacent the second electrode, and

an emitter which is an electroluminescent compound as claimed in claim 4, 5, or 6 interposed between the electron transport layer and the hole transport layer,

wherein voltage is applied to the two electrodes to produce an electric field across the emitter so that the emitter electroluminesces.

26. An electroluminescent device for use with an applied voltage, comprising:

a first electrode,

a second, transparent electrode,

a layer which is both an emitter and an electron transporter which is an electroluminescent compound as claimed in claim 4, 5, or 6 and which is located adjacent the first electrode, and

a hole transport layer which is interposed between the emitter and electron transport layer and the second electrode,

wherein voltage is applied to the two electrodes to produce an electric field so that the emitter electroluminesces.

27. An electroluminescent device for use with an applied voltage, comprising:

a first electrode,

a second, transparent electrode,

a layer which is all of an emitter, an electron transporter and a hole transporter which is an electroluminescent compound as claimed in claim 4, 5, or 6 and which is interposed between the first and the second electrode,

wherein voltage is applied to the two electrodes to produce an electric field so that the emitter electroluminesces.

28. An electroluminescent device for use with an applied voltage, comprising:

a first electrode,

a second, transparent electrode,

an electron transport layer which is a compound as claimed in claim 1, 2, or 3 and which is located adjacent the first electrode,

a hole transport layer adjacent the second electrode, and

an emitter which is interposed between the electron transport layer and the hole transport layer,

wherein voltage is applied to the two electrodes to produce an electric field so that the emitter electroluminesces.

29. An electroluminescent device for use with an applied voltage, comprising:

a first electrode,

a second, transparent electrode,

an electron transport layer which is located adjacent the first electrode,

a hole transport layer which is a compound as claimed in claim 1, 2, or 3 and which is located adjacent the second electrode, and

an emitter which is interposed between the electron transport layer and the hole transport layer,

wherein voltage is applied to the two electrodes to produce an electric field so that the emitter electroluminesces.

30. An electroluminescent device for use with an applied voltage, comprising:

a first electrode,

a second, transparent electrode,

a layer which is both an electron transporter and an emitter which is located adjacent the first electrode, and

a hole transport layer which is a compound as claimed in claim 1, 2, or 3 and which is interposed between the electron transport layer and the second electrode,

wherein voltage is applied to the two electrodes to produce an electric field so that the emitter electroluminesces.

31. An electroluminescent device for use with an applied voltage, comprising:

a first electrode,

a second, transparent electrode,

an electron transport layer which is located adjacent the first electrode, and

a layer which is both an emitter and a hole transporter which is a compound as claimed in claim 1, 2, or 3 and which is interposed between the electron transport layer and the second electrode,

wherein voltage is applied to the two electrodes to produce an electric field so that the emitter electroluminesces.

32. A method of detecting metal ions comprising the steps of: providing a photoluminescent compound as claimed in claim 4, 5, or 6 and detecting photoluminescence of said compound, wherein contact with a metal ion quenches said photoluminescence of said compound.

33. The method of claim 32, wherein said metal ions are selected from the group consisting of Zn^{2+}, Cu^{2+}, Ni^{2+}, Cd^{2+}, Hg^{2+} and Ag^{+}.

34. A method of detecting acid comprising the steps of: providing a photoluminescent compound as claimed in claim 4, 5, or 6 and detecting photoluminescence of said compound, wherein protonation of said compound changes the state of said compound's photoluminescence.

35. A method of harvesting photons comprising the steps of: providing a compound as claimed in claim 1, and providing light such that photons strike said compound and charge separation occurs in said compound.

36. A method of harvesting photons comprising the steps of: providing a compound as claimed in claim 2, and providing light such that photons strike said compound and charge separation occurs in said compound.

37. A method of harvesting photons comprising the steps of: providing a compound as claimed in claim 3, and providing light such that photons strike said compound and charge separation occurs in said compound.

38. The method as claimed in claim 35, 36 or 37, wherein said separated charges recombine and photons are released.

39. The method as claimed in claim 35, 36 or 37, wherein said separated charges migrate to respective electrodes to produce a potential difference.

40. A method of separating charges comprising the steps of: providing a compound as claimed in claim 1 and providing light such that photons strike said compound and charge separation occurs in said compound.

41. A method of separating charges comprising the steps of: providing a compound as claimed in claim 2 and providing light such that photons strike said compound and charge separation occurs in said compound.

42. A method of separating charges comprising the steps of: providing a compound as claimed in claim 3 and providing light such that photons strike said compound and charge separation occurs in said compound.

43. The method of claim 40, 41 or 42, wherein said separated charges recombine and photons are released.

44. The method of claim 40, 41 or 42, wherein said separated charges migrate to respective electrodes to produce a potential difference.

45. A photocopier employing the method of claim 35, 36, 37, 40, 41 or 42.

46. A photovoltaic device employing the method of claim 35, 36, 37, 40, 41 or 42.

47. A photoreceptor employing the method of claim 35, 36, 37, 40, 41 or 42.

48. A solar cell employing the method of claim 35, 36, 37, 40, 41 or 42.

49. A semiconductor employing the method of claim 35, 36, 37, 40, 41 or 42.

50. A molecular switch comprising a compound as claimed in claim 4, 5 or 6 that is capable of existing in more than one luminescent state, wherein acid, base, and/or incident light produces a change in the luminescent state of said compound.

51. A circuit comprising a molecular switch as claimed in claim 48.